Claim 79 constitutes claim 52 rewritten in independent form including all limitations of the base claim and any intervening claims.

Claim 80 constitutes claim 54 rewritten in independent form including all limitations of the base claim and any intervening claims.

Claim 81 constitutes claim 55 rewritten in independent form including all limitations of the base claim and any intervening claims.

Claim 82 constitutes claim 56 rewritten in independent form including all limitations of the base claim and any intervening claims.

Claim 83 constitutes claim 59 rewritten in independent form including all limitations of the base claim and any intervening claims.

II. FEES

The fee is calculated below:

For	Claims Remaining After Amendment	Highest Number Previously Paid For		Extra Claims	Rate		Additional Fee
Total Claims	80	– 60	=	20	x $18	=	$360
Independent Claims	21	– 3	=	18	x $84	=	$1512
Multiple Dep. Claim	0	0			$280	=	$0
Total Fee						=	$1872

Please charge the $1872 fee and charge any underpayment and credit any overpayment to Deposit Account No. 13-0016/276.

III. CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and

a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse shape in response to one of said perpendicular magnetic polarity transitions.

17. (Three Times Amended) A magnetic storage device comprising:

a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;

a read element for reading said perpendicular magnetic polarity transitions, said read element including:

a flux guide having a read gap, said read gap used for sensing said perpendicular magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to each of said perpendicular magnetic polarity transitions, and

a magnetoresistive element mounted in said flux guide for producing a readback pulse having a substantially Lorentzian pulse shape in response to said magnetic flux; and

circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse shape from said magnetoresistive element and to detect that said readback pulse has said substantially Lorentzian pulse shape, wherein said circuitry includes means for filtering said readback signal so that said readback signal has a greater resemblance to an ideal Lorentzian pulse shape.

30. (Twice Amended) A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes

from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes, and said detector is a peak detector.

Cancel claims 5, 20 and 36.

Add the following claims:

61. A magnetic recording system including a head, a magnetic media with perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a readback pulse with a substantially Lorentzian pulse shape from said head and to detect said substantially Lorentzian pulse shape, said head for transferring data between the magnetic media and an exterior environment, said head comprising:

a write element for inducing said perpendicular magnetic polarity transitions into a surface of said magnetic media during a write operation, wherein said write element comprises first and second write poles, and said first and second write poles have first and second cross-sectional areas, respectively, said second cross-sectional area being larger than said first cross-sectional area;

a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and

a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse shape in response to one of said perpendicular magnetic polarity transitions.

62. The magnetic recording system, as claimed in Claim 61, wherein said second cross-sectional area is about 10 to 100 times larger than said first cross-sectional area.

63. A magnetic recording system including a head, a magnetic media with perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a readback pulse with a substantially Lorentzian pulse shape from said head and to detect said substantially Lorentzian pulse shape, said head for transferring data between the magnetic media and an exterior environment, said head comprising:

a write element for inducing said perpendicular magnetic polarity transitions into a surface of said magnetic media during a write operation;

a yoke having a read gap for sensing said perpendicular magnetic polarity transitions, wherein said yoke includes first, second and third pole pieces in a common plane with said read gap, said common plane being defined by masking during fabrication; and

a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse shape in response to one of said perpendicular magnetic polarity transitions.

64. A magnetic recording system including a head, a magnetic media with perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a readback pulse with a substantially Lorentzian pulse shape from said head and to detect said substantially Lorentzian pulse shape, said head for transferring data between the magnetic media and an exterior environment, said head comprising:

a write element for inducing said perpendicular magnetic polarity transitions into a surface of said magnetic media during a write operation, wherein said write element comprises a write pole having a leading edge, said leading edge and said read gap are separated by a distance, and said leading edge of said write pole is separated from said read gap by about 2 to about 3 microns;

a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and

a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse shape in response to one of said perpendicular magnetic polarity transitions.

65. A magnetic recording system including a head, a magnetic media with perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a readback pulse with a substantially Lorentzian pulse shape from said head and to detect said substantially Lorentzian pulse shape, said head for transferring data between the magnetic media and an exterior environment, said head comprising:

a write element for inducing said perpendicular magnetic polarity transitions into a surface of said magnetic media during a write operation;

a yoke having a read gap for sensing said perpendicular magnetic polarity transitions, wherein a length of said read gap ranges from about 0.1 to about 0.2 microns; and

a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse shape in response to one of said perpendicular magnetic polarity transitions.

66. A magnetic storage device comprising:

a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;

a read element for reading said perpendicular magnetic polarity transitions, said read element including:

a flux guide having a read gap, said read gap used for sensing said perpendicular magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to each of said perpendicular magnetic polarity transitions, and

a magnetoresistive element mounted in said flux guide for producing a readback pulse having a substantially Lorentzian pulse shape in response to said magnetic flux;

a write element for writing said perpendicular magnetic polarity transitions on said magnetic media, said write element including:

first and second write poles having first and second ends, respectively, said first and second ends located proximate to a surface of said magnetic media, wherein said first and second write poles comprise first and second cross-sectional areas, respectively, said second cross-sectional area being larger than said first cross-sectional area, and

a coil element operatively coupled to said first and second write poles for writing to said magnetic media; and

circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse shape from said magnetoresistive element and to detect that said readback pulse has said substantially Lorentzian pulse shape.

67. The magnetic storage device, as claimed in Claim 66, wherein said second cross-sectional area is about 10 to 100 times larger than said first cross-sectional area.

68. The magnetic storage device, as claimed in Claim 66, wherein said write element is integral with said read element.

69. The magnetic storage device, as claimed in Claim 66, wherein said read element is positioned within said write element.

70. The magnetic storage device, as claimed in Claim 69, wherein said read element is physically smaller than said write element.

71. A magnetic storage device comprising:

a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;

a read element for reading said perpendicular magnetic polarity transitions, said read element including:

a flux guide having a read gap, said read gap used for sensing said perpendicular magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to each of said perpendicular magnetic polarity transitions, and

a magnetoresistive element mounted in said flux guide for producing a readback pulse having a substantially Lorentzian pulse shape in response to said magnetic flux;

a write element for writing said perpendicular magnetic polarity transitions on said magnetic media, said write element including:

first and second write poles having first and second ends, respectively, said first and second ends located proximate to a surface of said magnetic media,

a coil element operatively coupled to said first and second write poles for writing to said magnetic media, and

a non-magnetic spacer for substantially preventing flux flow through said write element during a read operation; and

circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse

shape from said magnetoresistive element and to detect that said readback pulse has said substantially Lorentzian pulse shape.

72. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes, and said detector is a class-4 partial response (PR4) detector.

73. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes, and said circuitry includes a high pass filter that receives said readback pulses and provides filtered readback pulses, which more closely resemble ideal Lorentzian pulse shapes than said readback pulses, to said detector.

74. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes;

wherein said magnetic storage device is devoid of a high pass filter between said magnetoresistive read element and said detector.

75. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes;

wherein said magnetic storage device is devoid of a differentiator between said magnetoresistive read element and said detector.

76. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes;

wherein said magnetic storage device is devoid of signal processing circuitry between said magnetoresistive read element and said detector.

77. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said first, second and third pole pieces are substantially aligned with one another and define a plane that is substantially parallel to a top surface of said magnetic storage media; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes

from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

78. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said yoke includes a non-magnetic spacer in said write flux guide that prevents magnetic flux from circulating through said write flux guide during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

79. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux

guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said first, second and third pole pieces are part of an air bearing surface that floats above said magnetic storage media on a small cushion of air during read and write operations; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

80. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said first, second and third pole pieces contact a lubricant on a top surface of said magnetic storage media during read and write operations; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

81. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in

said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said head includes write coils disposed between said first and third pole pieces but not between said first and second pole pieces; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

82. A magnetic storage device comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation, wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that provides a read gap, said read flux guide is integral with and positioned within said write flux guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in said write flux guide and provide write poles that define said write gap, said first and second pole pieces are in said read flux guide and provide read poles that define said read gap, and said head includes write coils disposed between said first and second pole pieces; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes

from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.

83. A tape drive comprising:

a magnetic storage media;

a head including a write element for inducing perpendicular magnetic polarity transitions in said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element mounted in a flux flow path of said yoke and recessed from said magnetic storage media for producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-one correspondence with said perpendicular magnetic polarity transitions during a read operation; and

circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes from said magnetoresistive read element, wherein said circuitry includes a detector designed to detect Lorentzian pulse shapes.